

Weekly Report

CIRA
STAR/NESDIS
National Oceanic and Atmospheric Administration (NOAA)

Submitted by: Maranda Hutson
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Prepared by: CIRA and STAR contributors

Products and Applications

Blowing Snow RGB to NWS: Both the ABI and VIIRS versions of the Blowing Snow RGB were installed in operations in NWS Alaska offices following a request from NWS Fairbanks, AK. The Blowing Snow RGB was developed by Bill Line (NESDIS/STAR) in collaboration with Carl Jones (NWS Grand Forks, ND) and CIRA, and has previously been installed in northern US plains NWS offices. The multispectral Imagery product combines multiple Imager channels to highlight blowing snow, which is a significant hazard to aviation and motorists. NWS forecasters provide Decision Support Services, forecasts, and warnings related to the blowing snow hazard. (POC: B. Line, SMCD/APDB, bill.line@noaa.gov) Funding: PDRA (submitted to SMCD report)



Figure: 27 March 2024 GOES-18 ABI (left) and VIIRS (right) Blowing Snow RGB over far northern Alaska, from AWIPS. Deadhorse, AK webcam view from within the blowing snow, showing significantly reduced visibility.

Publications (Citation: followed by a short Summary: (Why & so what), & detailed summary):

Citation: Tsukada, T., Horinouchi, T., & Tsujino, S. (2024). Wind distribution in the eye of tropical cyclone revealed by a novel atmospheric motion vector derivation. *Journal of Geophysical Research: Atmospheres*, 129, e2023JD040585. <https://doi-org.ezproxy2.library.colostate.edu/10.1029/2023JD040585>

Summary: We have developed a novel method to derive AMVs in the eye of TCs. In all three analyzed cases, algebraically growing wavenumber-1 disturbances were observed and in one case, the eye rotation accelerated by 1.5 times within 1 hour. We pursued its mechanism using the obtained AMVs.

Detailed Summary: Observations of wind distribution in the eye of tropical cyclones (TCs) are still limited. In this study, a method to derive atmospheric motion vectors (AMVs) for TCs is developed, where selection from multiple local rotation speeds is made by considering continuity among neighboring grid points. The method is applied to 2.5-min interval image sequences of three TCs, Lan (2017), Haishen (2020), and Nanmadol (2022), observed by the *Himawari-8* satellite. The results are compared with AMVs derived from research-based 30-s *Himawari-8* special observations conducted for Haishen and Nanmadol, as well as with in-situ dropsonde observations conducted for Lan and Nanmadol. In these storms, the AMVs obtained from the 2.5-min interval images in the eye are found to be in good agreement with the dropsonde observations. Examinations of AMVs in the eye reveal transient azimuthal wavenumber-1 features in all three TCs. These features are consistent with algebraically growing wavenumber-1 disturbances, which transport angular momentum inward and accelerate the eye rotation. In the case of Lan, the angular velocity in the eye increased by approximately 1.5 times within 1 hour. This short-term increase is further examined. Visualization of low-level vorticity in the eye and angular momentum budget analysis suggests that angular momentum transport associated with mesovortices played an important role in the increase of tangential wind and the homogenization of angular velocity in the eye of Lan. (POC: T. Tsukada, CIRA; taiga.tsukada@colostate.edu)

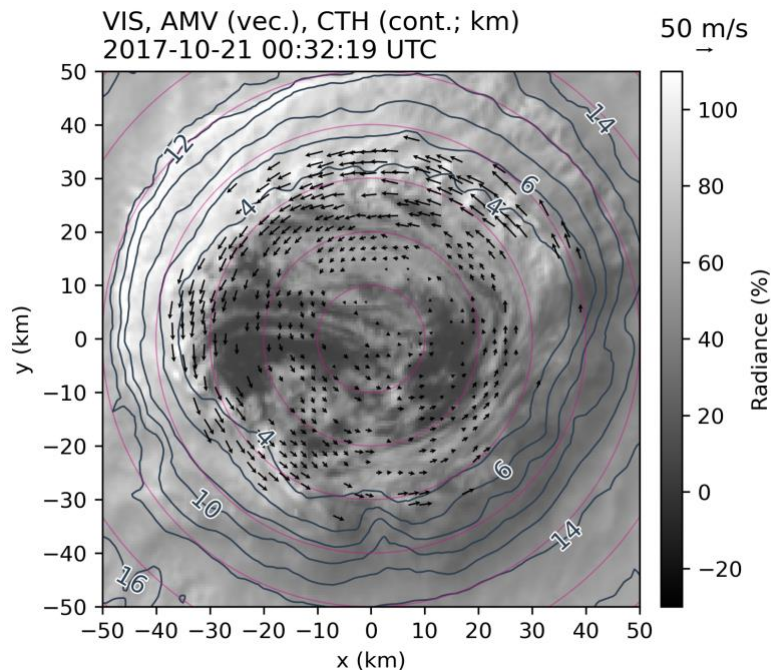


Figure: Example of AMVs in the eye of Typhoon Lan (2017) obtained from the 2.5-min interval image sequence (vectors) overlaid on the reflectivity (gray shading) at the central time of tracking at 00:32:19 UTC 21 October 2017. The contours represent the estimated cloud-top

height (km). The purple circles are the 10-km interval radii.

Awards and Recognition

Travel, Workshops, Conferences, and Meeting Reports

American Meteorological Society (AMS) 36th Conference on Hurricanes and Tropical

Meteorology: May 6-10, 2024, Long Beach, CA. Hosted by the AMS Committee on Tropical Meteorology and Tropical Cyclones, this conference promotes the exchanging of information between scientists and encourages application of research to operational problems.

NOAA/StAR employees and CIRA Tropical Cyclone group members presented 19 abstracts and posters at this week’s AMS 36th Conference on Hurricanes and Tropical Meteorology. Scientists from the group co-authored 20 additional abstracts/posters.

See below for the full list of presentations with CIRA authors/co-authors. (POCs: A. Brammer, G.Chirokova, M. DeMaria, R. DeMaria, I. Ebert-Uphoff, K. Haynes, A. Libardoni, L. Lu, J. Knaff, J. Martinez, C. McClelland, M. McGraw, D. Molenaar, K. Musgrave, N. Razin, J. Rogers, Z. Ruan, C. Slocum, T. Tsukada. (alan.brammer@colostate.edu, galina.chirokova@colostate.edu, mark.demaria@noaa.gov, robert.demaria@colostate.edu, imme.ebert-uphoff@colostate.edu, katherine.haynes@colostate.edu, alex.libardoni@colostate.edu, lixin.lu@colostate.edu, john.knaff@noaa.gov, jon.martinez@colostate.edu, coleman.mcclelland@colostate.edu, marie.mcgraw@colostate.edu, debra.molenaar@colostate.edu, kate.musgrave@colostate.edu, naufal.razin@colostate.edu, jonathan.rogers2@colostate.edu, zhixing.ruan@colostate.edu, christopher.slocum@noaa.gov, taiga.tsukada@colostate.edu)

Funding: NOAA/NESDIS, CPEX, TCRT, RAD-SAT JTWC, NASA ROSES, HFIP, RAM-HORNS, STI Gusts, AI2ES, JHT TCANE, MIST)

Presenter/Co-Authors	Title of Presentation/Poster
Alan Brammer, J. Zawislak, J. P. Dunion	Overview of African Easterly Wave Characteristics over the Eastern Atlantic during the CPEX-CV 2022 Field Campaign
Alex G. Libardoni, N. Razin	CIRA Efforts to Expand the Availability and Use of Tropical Cyclone Centered Microwave Imagery
Alex G. Libardoni, S. J. Fletcher, M. Zupanski	Estimating the Impact of Assimilating AEOLUS Winds and Mesoscale Atmospheric Motion Vectors on Tropical Cyclone Forecasts: A Case

	Study with Hurricane Dorian
Andrew Penny, L. Paulik Alaka, W. Booth, M. DeMaria, C. L. Fritz, P. Santos, A. Taylor	Toward Improving the Wind Field Used in the P-Surge Probabilistic Storm Surge Model
Christopher Slocum, J. Knaff	Leveraging Subjective Dvorak Technique Cloud Patterns to Understand Tropical Cyclone Evolution
Coleman McClelland, G. Chirokova, M. DeMaria, D. Molenaar, M. Goldberg, M. Pieper, J. Darlow, M. Surratt, R. T. DeMaria, A. Brammer, S. N. Stevenson, W. A. Hogsett, R. V. Leslie, W. J. Blackwell	Towards Implementation of TROPICS Data in NHC and JTWC Operations
Daniel R Chavas, J. Knaff, P. J. Klotzbach	A Simple Model for Predicting the Tropical Cyclone Minimum Central Pressure from Intensity and Size (Invited Presentation)
Derrick C. Herndon, C. S. Velden, T. L. Olander, J. D. Hawkins, G. Chirokova, A. J. Wimmers, S. Griffin	From Vern's Vision to Computer Vision: The Evolution of Tropical Cyclone Intensity Estimation from Satellite Data
Galina Chirokova, M. DeMaria, Z. Ruan, R. T. DeMaria, J. Knaff, M. Pieper, A. B. Milstein, S. N. Stevenson, W. A. Hogsett, J. Darlow	Estimating Tropical Cyclone Intensity and Structure from TROPICS data
John Kaplan, G. Chirokova, G. Foltz, D. Molenaar, M. DeMaria, I. Ebert-Uphoff, J. Darlow, S. N. Stevenson, W. A. Hogsett	Improving Operational Tropical Cyclone Intensity Guidance Suite and Situational Awareness with Better Metrics of Ocean-TC interaction
John Knaff	Using Satellite Derived Motion Winds to Improve Monitoring and Forecasting of Tropical Cyclones

Jonathan L. Vigh, K. Musgrave, P. A. Kucera, R. T. DeMaria, J. H. Gotway, T. L. Jensen, K. Newman, G. P. McCabe, M. Win-Gildenmeister, T. Burek, A. Brammer, W. A. Hogsett	Integration of Model Large-Scale Environmental Diagnostics for Tropical Cyclones into the Enhanced Model Environmental Tools (METplus) Verification System
Jonathan Martinez, C. A. Davis, R. Rios-Berrios	Relating the Frequency of Tropical Cyclogenesis Events to the Scale of Precursor Disturbances in Aquaplanet Simulations with Different Horizontal Grid Spacings
Jonathan Martinez, P. Duran, C. J. Schultz, E. C. Bruning, S. N. Stevenson, B. Trabling	Assessing the Microphysical Characteristics and Updraft Kinematics of Eyewall Convection in an Idealized Simulation of a Tropical Cyclone Undergoing Intensity Vacillation Cycles
Jonathan Martinez, W. A. Hogsett, K. Musgrave, D. A. Zelinsky, J. P. Cangialosi, B. Trabling, S. N. Stevenson, S. M. Camposano, A. Brammer, M. Onderlinde	Evaluating the Operational Hurricane Analysis and Forecast System Version 1 (HAFSv1) Models and Developing Products for Cloud AWIPS at the National Hurricane Center
Kate D. Musgrave, M. DeMaria	Exploration of Satellite Predictors in the Statistical Hurricane Intensity Prediction Scheme (SHIPS)
Katherine Haynes, C. Slocum, J. Knaff, K. Musgrave, N. Razin, I. Ebert-Uphoff	Aiding Tropical Cyclone Forecasting by Creating Synthetic 89- and 37- GHz Imagery from Operational Geostationary Satellites
Kyle A. Hilburn, K. Musgrave, S. N. Stevenson	Withdrawn: What Does Lightning Tell Us About Tropical Cyclone Structure Relevant to Forecasting Intensity Change?
Lixin Lu, M. DeMaria, J. A. Zhang, A. Hazelton, J. Kaplan, P. Santos, N. J. Carr	Development of Wind Gust Parameterizations for Tropical Cyclone Surface Wind Prediction Models

Marie McGraw	Exploring Tropical Cyclone Structure and Evolution with AI-based Synthetic Passive Microwave Data
Mark DeMaria, E. A. Barnes, M. Fernandez, R. J. Barnes, M. McGraw, G. Chirokova, L. Lu, P. Santos, W. A. Hogsett	Applications of a Machine Learning Model for Estimating Tropical Cyclone Track and Intensity Forecast Uncertainty
Matthew Onderlinde, M. DeMaria, P. Santos, L. Lu, A. Brammer, K. Musgrave, G. DeMaria, J. Rogers	The National Hurricane Center (NHC) Two-Dimensional Wind Forecasts
Milton Salvador Gomez, M. McGraw, L. Poulain-Auzeau, F. Iat-Hin Tam, S. Ganesh Sudheesh, S. J. Camargo, D. R. Chavas, Y. Cohen, T. Beucler	TCBench: A Platform for the Data-Driven Prediction of Tropical Cyclones
Muhammad Naufal Razin	Secondary Eyewall Detection in Passive Microwave Imagery
Muhammad Naufal Razin, C. Slocum, J. Knaff, K. Haynes, M. McGraw	Updates on the Tropical Cyclone Precipitation, Infrared, Microwave, and Environmental Dataset (TC PRIMED)
Nicholas Mesa, B. Trabling, M. M. Bell, A. Brammer, P. Duran, P. J. Klotzbach, K. Musgrave, S. N. Stevenson	Investigating the Spatial and Temporal Evolution of Lightning in Pre-depressions Ida (2021) and Idalia (2023) Using the Geostationary Lightning Mapper
Pablo Santos, M. DeMaria, A. Brammer, M. Onderlinde, K. Musgrave, W. A. Hogsett	The National Hurricane Center (NHC) Next Generation Wind Speed Probability (WSP) Model
Patrick Duran, C. J. Schultz, J. Martinez, E. C. Bruning, S. N. Stevenson, B. C. Trabling, K. Mollette	Relating Lightning Flash Characteristics to Convective Structure in Tropical Cyclones
Philippe P. Papin, J.P. Cangialosi, E.S. Blake, D.J. Halperin, R.E. Hart, A. Brammer	Incorporating Tropical Cyclogenesis Guidance Tools (Probabilistic and Spatial) for Verification at the National Hurricane Center

R. Vincent Leslie, W. J. Blackwell, S. A. Braun, T. Matsui, R. Bennartz, C. S. Velden, M. DeMaria, L. E. Gumley, C. Kidd, T. J. Greenwald, D. C. Herndon, G. Chirokova	NASA TROPICS Earth Venture Mission: Data Products
Ryan A. Lagerquist, G. Chirokova, R. DeMaria, M. DeMaria, I. Ebert-Uphoff, J. Knaff, C. Slocum, W. A. Hogsett, S. N. Stevenson, J. Darlow	GeoCenter: Real-Time Deep Learning with Uncertainty Quantification for Center-Fixing of Tropical Cyclones
Samantha M Camposano, G. Wagner, D. E. Rudack, P. Santos, M. DeMaria, M. Onderlinde, G. Manikin	Using Feature-Based Methods to Blend Tropical Cyclone Official Forecasts in the National Blend of Models
Samantha M Camposano, P. Santos, M. DeMaria, M. J. Brennan	Probabilistic Guidance for Tropical Cyclone Inland Wind Watches and Warnings
Stephanie N. Stevenson, W. A. Hogsett, A. Brammer, S. M. Camposano, J. Martinez	Modernizing the R2O and O2R machine at the National Hurricane Center
Taiga Tsukada, T. Horinouchi, S. Tsujino	Wind Distribution in the Eye of Tropical Cyclone Revealed by a Novel Atmospheric Motion Vector Derivation
Takeshi Horinouchi, T. Tsukada, S. Tsujino, U. Shimada	Role of Wavenumber-1 Disturbances in Redistributing Angular Momentum in TC Eyes: Implication from High-Resolution AMVs
Wallace A. Hogsett, J. Martinez	Updraft-Scale Dynamics of Tropical Cyclone Intensification
William J. Blackwell, R. V. Leslie, A. B. Milstein, G. Perras, M. Pieper, N. Zorn, S. A. Braun, C. S. Velden, C. Kidd, T. Matsui, M-J. Kim, T. Greenwald, J. D. Hawkins, D. C. Herndon, R. Bennartz, M. DeMaria, G. Chirokova, J. P. Dunion, F. D. Marks, R. F.	New Observations from the NASA TROPICS Constellation Mission in the Atlantic and Eastern Pacific Basins

Rogers, K. E. Ryan, B. Annane, G. R. Alvey, B. A. Dahl, K. Cahoy	
Zhixing Ruan, G. Chirokova, M. DeMaria, Y. Zhu, J. Knaff, C. Slocum, S. N. Stevenson, W. A. Hogsett, J. Darlow	Cyclone Type Classification Using JPSS Data and Machine Learning

OSTP-NOAA workshop on AI/ML for Weather Prediction: On May 6, 2024 the White House Office of Science and Technology Policy (OSTP) and NOAA held a one-day (invitation only) workshop on *The Potential for Artificial Intelligence and Machine Learning (AI/ML) to Transform Numerical Weather Prediction*. The workshop was held in the Herbert C. Hoover Building in Washington, DC, and featured six one-hour panels, plus a few short talks. It was attended by 62 participants (51 in-person and 11 virtual) and brought together scientists from different sectors: academia (12), private sector (12 - NVIDIA, Google, AWS, Weather Company, Microsoft), federal (37 - NOAA, DOE, USAF, Navy, and others) and EU government (1 - ECMWF). Imme Ebert-Uphoff represented CIRA, was in fact the only workshop participant from a CI, and served on Panel #4. Discussions throughout the day primarily focused on taking stock of the current status and the future potential of AI in weather forecasting, and on identifying challenges and opportunities to increase NOAA’s activities in this area, including increasing collaboration with colleagues in other sectors. A special treat for the participants was a reception at the end of the day in the Indian Treaty room of the Eisenhower Executive Office Building - a large office building, next to the West Wing of the White House. (POC: I. Ebert-Uphoff, CIRA, iebert@colostate.edu. Funding: CIRA ML strategic initiative.)



Workshop Panel #3 featuring NOAA colleagues (from left to right) Jebb Stewart (GSL), Sergey Frolov (PSL), Kevin Garrett (STI), Isidora Jankov (GSL), Corey Potvin (NSSL), and Daryl Kleist (EMC) as panelists and Dr. Michael Morgan (Assistant Secretary of Commerce for Environmental Observation and Prediction) as panel moderator. Ebert-Uphoff (CIRA) served on Panel #4.

Training and Education activities

Satellite Book Club Seminar: Bill Line presented “Applications of Satellite Products During Convective Weather Scenarios” for this week’s Satellite Book Club (SBC) Seminar Series. The presentation shared best practices for leveraging NOAA satellite imagery and products in operations during severe weather events. The SBC convenes weekly to provide an opportunity for scientists throughout the NOAA satellite domain to share a topic of interest, followed by an open discussion. There were over 96 entities in attendance. A recording for the webinar can be found [here](#). (POC: B. Line, SMCD/APDB, bill.line@noaa.gov) Funding: PDRA

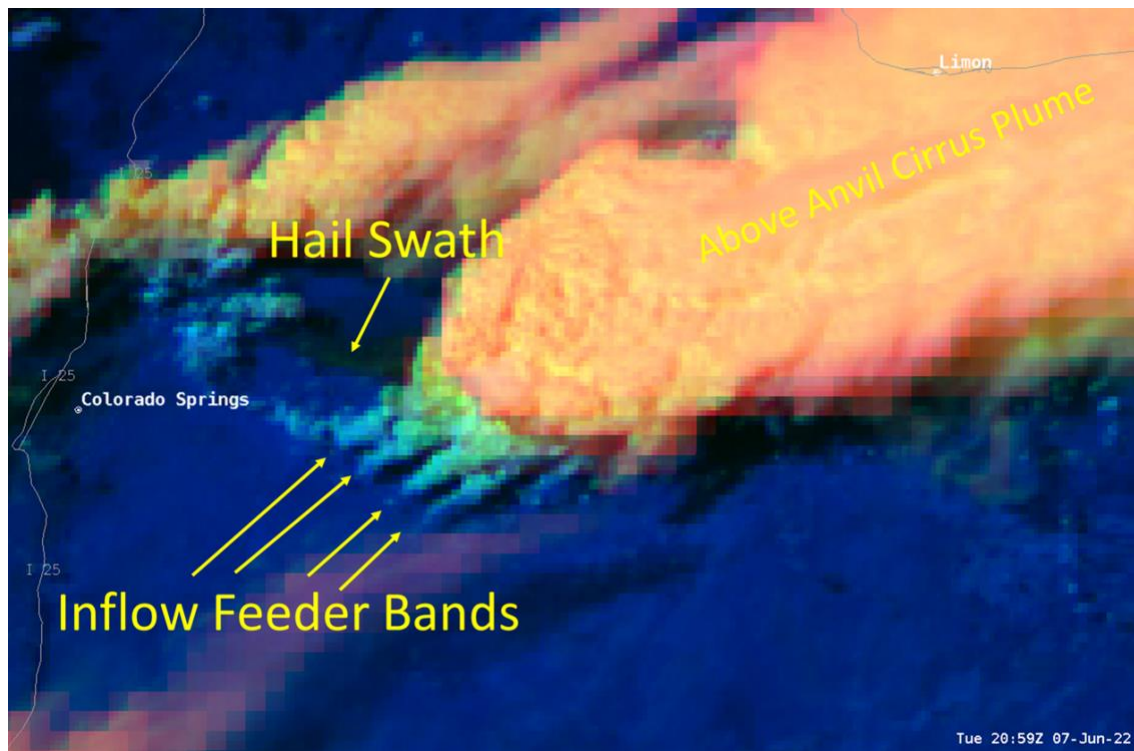


Figure: From SBC webinar, GOES-East Day Cloud Phase Distinction RGB image of severe thunderstorm with notable features annotated.

Two new VISIT - JPSS Blogs: J. Torres (CIRA) produced two JPSS blogs that focus on ‘Flooding in the UAE and Oman’ and ‘NOAA-21 Designated as the Primary Satellite of the JPSS Constellation’. The first blog covers the significant flooding event that occurred in the Middle East while the second blog highlights the finalized JPSS orbital configuration and shows how that translates to what is seen in the imagery. Links to both blogs can be accessed below.

<https://rammb.cira.colostate.edu/training/visit/blog/index.php/2024/04/26/flooding-in-the-uae-and-oman/>

<https://rammb.cira.colostate.edu/training/visit/blog/index.php/2024/05/03/noaa-21-designated-as-the-primary-satellite-of-the-jpss-constellation/>

(POC: J. Torres, CIRA, jorel.torres@colostate.edu) Funding: JPSS.

Future Meetings and Events (dates, meeting/event, location, staff involved)

Other

CIRA Imagery Featured in NOAA Social Media Posts: In the first week of May 2024, numerous satellite visuals created by the Imagery Production Team made available in CIRA’s Satellite Library were used in several posts made by NOAA social media accounts. More information and links can be found below. (POC: D. Smith, dakota.smith@colostate.edu K. Erickson,

kim.erickson@colostate.edu, J. Reiter, josh.reiter@colostate.edu, CIRA) Funding: GOES-R.

NOAA Satellites on X (formerly Twitter), Instagram, & Facebook: “It’s been a stormy week – NOAA’s GOES-East kept a close eye”. X:

<https://twitter.com/NOAASatellites/status/1788571350313181437>; IG:

<https://www.instagram.com/p/C6wC748rg0L/>; FB: <https://fb.watch/rZlFgoe5e4/>.



NOAA Satellites on X (formerly Twitter), Instagram, & Facebook: “Today’s Timelapse Tuesday animation is water vapor imagery from NOAA’s GOES-East showing the series of storms that drenched Texas and Louisiana last week”. X:

<https://twitter.com/NOAASatellites/status/1787864043874910653>; IG:

<https://www.instagram.com/p/C6rAYbbNqr9/>; FB: https://fb.watch/rZlUDy_FKf/.

NOAA Satellites on X (formerly Twitter), Instagram, & Facebook: “NOAA’s GOES-East tracked the bubbling clouds and frequent lightning from severe thunderstorms that struck the nation’s midsection”. X: <https://twitter.com/NOAASatellites/status/1787826175584145795>; IG:

<https://www.instagram.com/p/C6qxDJwAk8z/>; FB: <https://fb.watch/rZm0rKGsZ6/>.

NOAA Satellites on X (formerly Twitter) & Facebook: “NOAA satellites will be helping to keep you safe and informed this hurricane season”. X:

<https://twitter.com/NOAASatellites/status/1787466304707788926>; FB:

<https://fb.watch/rZmezvPFYQ/>.

NOAA Satellites on X (formerly Twitter), Instagram, & Facebook: “Yesterday, NOAA’s GOES-East watched severe thunderstorms erupt over the Texas Panhandle”. X:

<https://twitter.com/NOAASatellites/status/1786044005421359122>; IG:

<https://www.instagram.com/>; FB: https://fb.watch/rZmlOaAT_7/.